THE MAC Flyer

JUNE 1987

Low—Level Killer . . . Page 16

THE MAC Flyer

For Greater Safety in MAC Air Operations

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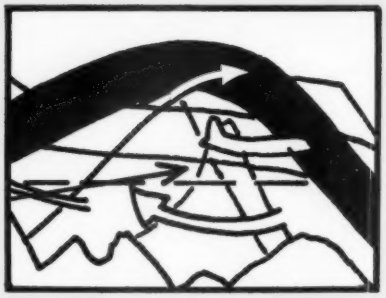

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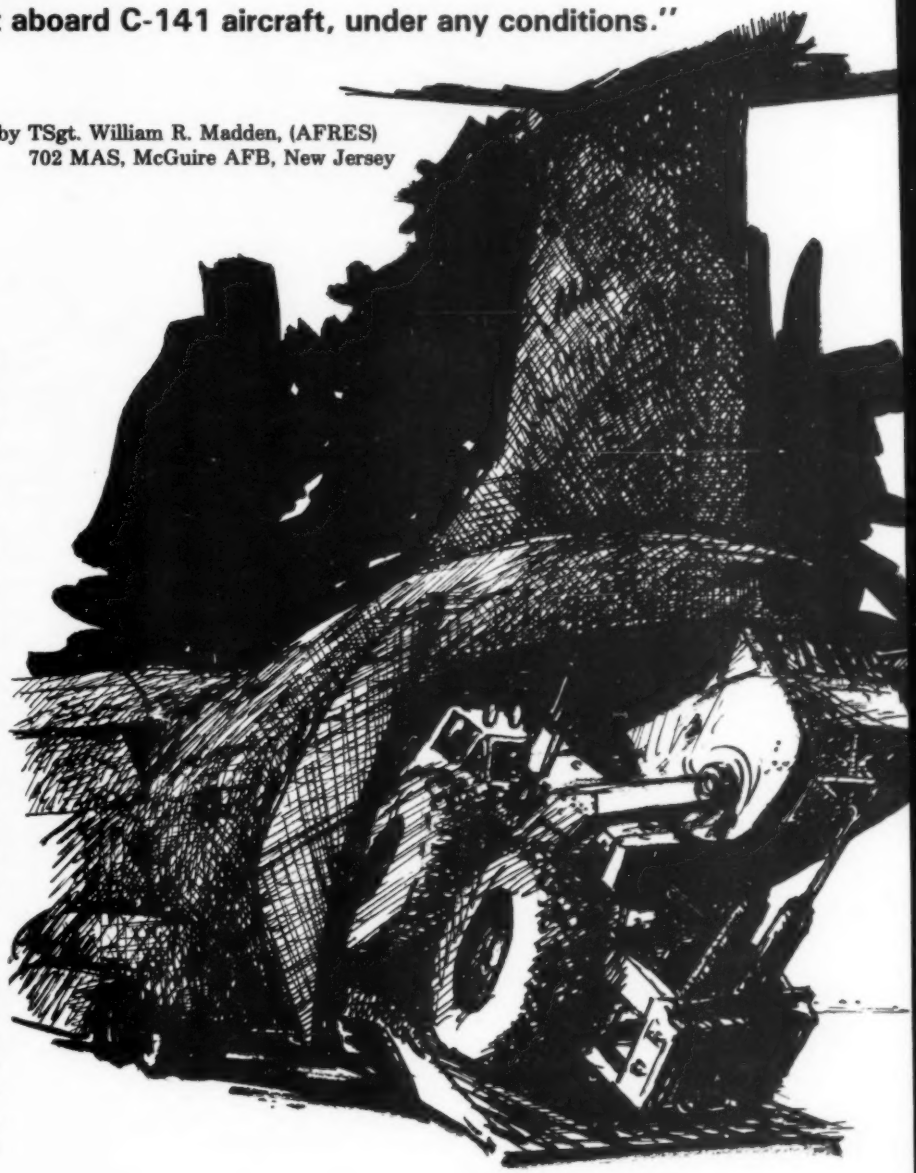
The Fangs That Bite

"Unsuitable for shipment aboard C-141 aircraft, under any conditions."

by TSgt. William R. Madden, (AFRES)
702 MAS, McGuire AFB, New Jersey



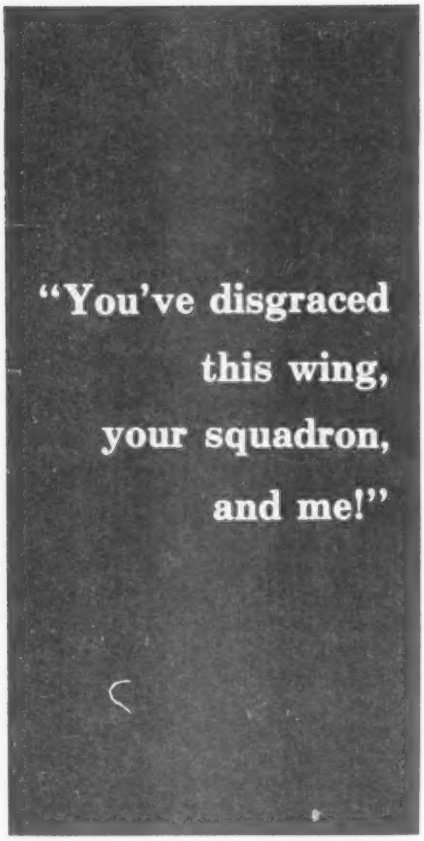
"I don't know! It's up to you, Load."

The loadmaster's name was Rogers and the loading crew leader looked at him with the obvious relief of one who was in the clear, regardless of the coming decision.

Rogers was apprehensive. He was sure the exercise was carefully watched, not only for the usual reasons, but because they were very close to a third-world conflict zone. He knew his aircraft and crew could be drawn into some logistical mission at any time in support of American interests. An echelon of C-141s wheeled overhead on their return from a drop zone somewhere. There were Herks and fighters preparing to fly with APUs and GTCs rasping everywhere. It was hard to believe training was the paramount reason for the exercise named "Cobra Strike I."

His C-141 had been scheduled for a quick-turn. They were parked on the ramp, the upload was wheeling into position behind the airplane, and the other crewmembers were dashing for a quick bite while they could. Rogers was alone.

HONORABLE MENTION 1986 MAC FLIGHT SAFETY WRITING CONTEST



Rogers had asked about the loadability of the massive yellow machine backing into the loading area. He had never seen one like it before. Big black letters on the cab identified it as a "JUNGLE MASTER, MODEL VH-2." It looked like an all-purpose machinery with so many attachments it reminded Rogers of a Swiss army knife. Someone had penciled "The Jabberwock" on the side of the machine.

He would have to look up this machine in the Dash Nine, Section VI. But the other crewmembers, in their zeal to help, had buried Rogers' book bag beneath a ton of crew baggage, all stacked against the right side of the forward bulkhead. By the time the worried loadmaster realized where his books were, he'd lost precious time; fumbling through the pile would waste even more. The loading crew was looking askance at him already; he didn't want to lose face and appear uncertain. What if it got back to the squadron that he appeared unsure? It could easily happen; then he would get a no-notice check ride, for sure. He decided time was more important and abandoned his search. He consoled himself with the fact that he had never scratched an airplane in his life. He would do everything slowly and carefully.

He asked for the weight of the vehicle. They hadn't weighed it! The scales had broken down yesterday. They estimated the monster weighed 50,000 pounds. The tires were studded with hard rubber and the two axles were very close together. That was one possible problem, he knew, and he couldn't remember the limitations of the aircraft cargo ramp and the auxiliary ramps since the latest change in the Dash Nine. Right now he couldn't remember much of anything. They certainly wouldn't give him something unloadable, would they?

"Have you loaded this machine before?" he asked.

"Oh, yes. Last week, many time, every day," the loading crew responded in their broken English, all too quickly. Rogers knew that couldn't be true.

"It go okay?"

The crew leader nodded agreement. The loadmaster doubted them all. He knew they wanted to go off duty, and the sooner the better. It was time for a shift change. Still, maybe they *had* done all this before . . . .

Meanwhile, he was delaying everyone with his indecision. Changing his mind, he raced back to the pile of bags to uncover his much-needed reference in the Dash Nine. Halfway through, he was interrupted by the ramrod, a captain from ATOC with a radio and a grim, officious manner.

"Sir?"

"Your blocks are 1600 local, Sergeant Rogers. Do you have some sort of problem?"

"No sir, just clearing a path for the winch cable. Triple line winching for that thing, you know," the words tumbled from his mouth. Too late now . . . .

"Fine," answered the captain, relieved. "You're just a bit behind. We've got ten more birds to load. Just give a shout if you need anything," he said, and left through the crew entrance door.

Rogers directed the positioning of the vehicle and placed the observers as required by the checklist. The parking brake was set, the whiffletrees and cable configured, and he was ready.

He had strung the cable for triple line pull to compensate for an error in their weight estimate. The winch drew up the slack cable, and Rogers watched the huge machine with its steel backhoe protruding far in front of it like a deadly fang prepare to move. The operator sat nervously atop it, leaning sideways for a better view.

Twenty minutes left until scheduled block time. Too late to have a good briefing with the driver, but after all, they said they had done this before.

The huge tires contacted the auxiliary ramp toes. Alignment was good and the loadmaster continued the winching. Up rose the first axle, then the second, close behind. The extended backhoe was inside the airplane already, and the operator hydraulically controlled the bucket to the correct height. So far there were no clearance

problems. The ramps groaned a little under the weight, but Rogers was unconcerned.

Suddenly he became aware of a commotion across the ramp in the direction of ATOC. A man was running toward him, waving his arms frantically, signalling Rogers to stop. The winching halted with the vehicle still straining the winch cable; one axle had just reached the integral ramp.

"Where are you going with my rig?" screamed the excited newcomer. "*That* doesn't go on any airplane, never has! That rig goes on my flat-bed truck right over there. They made a mistake and wheeled it out here. You gotta get it off there! They had you fragged for gamma goats and troops, not my machine!" He stood looking at Rogers with hands on his hips, exasperated.

Frag? Rogers remembered, then. He *had* got some kind of load sheet, way back when, at the original briefing, but of course that too was inside his book bag.

"All right, let's take it off." He rebriefed his loading crew, and the winch paid out. Both axles once again were astride the auxiliary ramps. The groaning of the ramps intensified and in the next few seconds chaos erupted in front of the loadmaster—for the first time in his career.

The left auxiliary ramp lost its understructure and buckled severely, tilting the massive machine to the left. The operator, scrambling for his life, abandoned the rig and reached safety. Fortunately, clearance monitors ran also. The winch operator stopped the winch when he heard the screams of alarm, leaving the outstreched bucket inside the airplane and perilously close to the left side. Finally, as Rogers watched in horror, the left ramp caved in completely, and the machine smashed downward and to the left. The winch cable was crushed and snapped cleanly, ending up with a crash against the forward bulkhead. The bucket slashed against the airplane, careening madly around as the vehicle toppled onto its side; the extreme aft interior of the airplane was badly damaged, and the ramp hinge area, as Rogers, stunned, could see was badly twisted. There was no doubt; major airframe damage.

The body of steel that had, minutes ago, been capable of important military construction jobs, lay silent, turned on its side with the bucket arm turned grotesquely upward where it had crashed against the left petal door, itself ripped and at a new angle. The free-wheeling tires spun slowly, and there were sounds of windblown cowling loose on the great fallen yellow beast.

No one was hurt. Rogers ran for the cockpit radio to call the fire department but halfway there saw them already coming. ATOC must have seen it all!

He stood numbly as his fellow crewmembers arrived. The fire marshall had questions; Rogers was the center of attention. He could see the loading crew being questioned. A considerable crowd gathered, many wearing eagles on their shoulders, all dismayed and visibly disgusted.

"Sergeant Rogers, get in the back, please," requested the captain from ATOC.

The loadmaster got in the blue staff car, joining his aircraft commander, who still carried the flight plan data he had hoped to use. They sat in area headquarters.

"Men, when you don't have the big picture, you can't possibly realize the consequences of a major setback like this."

Rogers and his AC sat quietly at attention.

"The airframe itself, and the equipment you've damaged, is one thing. But have you noticed, there really wasn't much room to taxi out there. Now there isn't any at all. We can move your airplane with a tug, but not until we get the ramp disconnected from the airplane. We can conceivably build a steel taxiway to give adequate clearance for other aircraft to taxi on, but we don't have the luxury of time. Things have heated up across the border as we expected, and *you* were to be the first to go, with needed troops! What I'm telling you is that you have jeopardized a small nation, struggling for its freedom. *They wanted us there today!* You've had a negative impact on that country; you've disgraced this wing, your squadron, yourselves, and me! Every aircraft coming here has to back-taxi on the active runway. We've already cancelled support out of here. They'll be flying in from a farther station, which again is less effective tactically, and more expensive."

The wing commander ordered the crew to quarters. Rogers was reunited with his books and now had time to ponder the ramifications of laxness and poor judgment. The actual weight of the vehicle had been close to 80,000 pounds. "Unsuitable for shipment aboard C-141 aircraft, under any conditions," he could now read, *but much, much too late.*

TSgt. Madden is a Reserve loadmaster on the C-141-B. He is employed in civilian life by Western Union Telegraph Company as an Operations Engineer and controls the Westar Communications Satellite. He is also an instrument rated commercial pilot.

FATIGUE

by J. Markle

Fatigue is part of aviation and is something every flier will experience. The most severe and obvious case of fatigue is demonstrated by the pilot who falls asleep in the cockpit, with potentially catastrophic results. Fatigue can be more insidious, however, and quite long-ranging in its effects and onset. It can be aggravated by a host of contributing factors such as poor nutrition, illness, wounds, emotional stress, boredom, time zone changes, aircraft vibrations, sleep deprivation, age, experience, and personality. All (or any combination) of these can interact to produce a dangerous situation.

Fatigue is most often described in terms of sleep deprivation, but is actually more than a sense of sleepiness. It can be subtle physiological wear and tear that leads to loss of coordination, inattention,

PSYCHOMOTOR CHANGES SEEN WITH FATIGUE.

Reaction time increases.
Memory decreases.
Communication skill decreases.
Decision-making time slows.
Tracking ability (following an object with your eyes) decreases.
Irritability, anxiety, and depression increase.
Attention span decreases.
Errors increase.
Cooperativeness decreases.
Ability to accept criticism decreases.
Physical activity decreases.
Personal care (hygiene) decreases.

and poor judgment. Fatigue can be measured by counting the number of mistakes an individual makes while performing a simple physical task. "Performance decay" is noted before the individual actually feels tired and is the first sign of fatigue. Couple this with the poor judgment accompanying fatigue and you can easily see how an individual can make small errors and not even recognize he or she is making them. Missing tiny errors or small cues such as minor oil pressure fluctuations is called "blocking." In this case, major cues are noticed, but minor ones aren't. Also, deleting certain instruments from one's normal instrument crosscheck or inappropriate fixation on a gauge may occur. In fact, you may not even notice your own level of fatigue until errors are major.

The human body and its physiological functions are strongly controlled by the biological clock—a 24-hour, day-night variation or rhythm of body functions called the circadian rhythm. This includes body temperature, alertness vs. sleep, eating and appetite, hormone levels, performance, and behavior. Mental performance and memory is high between 0800 and 1400 hours and then drops off during the afternoon. A recent study showed increased aircraft mishaps for tactical aircraft flights originating between 1800 and 2100 hours, and 2400 and 0900. Helicopter mishaps reached high levels for flights departing between 2100 and 2400. All of this simply means that at night the aviator is asked to perform at maximum capacity, when the body is saying, "It's time to sleep—I'm not ready for work."

Multiple time zone changes affect susceptibility to fatigue. This is probably due to length of travel and confusion of the biological clock. A study to determine effects of time zone changes on performance (using performance testing) showed that after 48 hours, an individual was only 50 percent recovered from change in time zone.

The flight environment itself is fatiguing. Aircraft vibrations and noise increase fatigue. Depending on type and frequency of aircraft vibration, a person can have a variety of problems, including visual and motor skill degradation. Muscular problems may also be induced by aircraft vibration. These may include joint and tendon problems. Ensuing pain may reduce attention capacity and increase other effects of fatigue. Additionally, pressurized air used at altitude is extremely dry. This, combined with poor hydration techniques, makes it easy to become dehydrated.

Dehydration contributes significantly to fatigue and performance decrement. Coffee, or other caffeinated beverages, will compound the fatigue factor induced by dehydration due to caffeine's effect on the urinary system. Water is the *best* choice for rehydration.

Another factor contributing to fatigue is illness. Illness requires a great deal of the body's energy as the body attempts to heal itself. Pain and discomfort reduce a person's ability to withstand stress—both physical and emotional. As a result, susceptibility to fatigue is greatly increased due to illness.

Emotional stress promotes fatigue because it causes increased inattention (the mind tends to focus on the stress-causing incident rather than dealing with the task at hand). Additionally, severe depression causes a sense of fatigue by itself and is associated with sleep disturbances. Boredom also leads to inattention and a sense of fatigue.

Operational fatigue is an accumulation of effects which stem from demanding flight operations (i.e. long hours and irregular eating and sleep patterns). Talk about confusing the biological clock! This will really do it! A person may appear normal, but will function mechanically—mental alertness is just not there. There is evidence, however, that young, healthy, and highly motivated people can perform for long periods of time before operational fatigue causes a measurable drop in performance.

Fatigue is an almost unavoidable fact of life in the aviation world, due to the nature of operations. Personal attitude and motivation can do a lot to combat fatigue. Factors that lead to fatigue can be reduced by resting sufficiently to compensate for early launch times and time zone changes; eat balanced meals; and ensure adequate fluid intake. Don't fly if you're ill and, if your personal life is causing problems, talk to someone about it. Most of all, enjoy what you're doing!

Courtesy: DC Approach

PHYSIOLOGICAL CHANGES THAT ACCOMPANY FATIGUE

- Body temperature decreases.
- Physical strength decreases.
- Blood sugar (glucose) increases.
- Pupil response time to light increases (time for natural eye reflex to light.)
- Binocular vision decreases.
- Time for visual accommodation increases.
- Circulating blood volume decreases.
- Heart rate increases.
- Eye fatigue increases.
- Muscle glycogen (energy stores) decrease.
- Muscle control and coordination decrease.

TMF INSTRUMENT QUIZ

Welcome to summer! Before you get too comfortable with the idea of beach blankets, barbecues, bronzed bodies, and days of fun in the sun, we have another mind-boggling *TMF* Instrument Quiz for you. But, is it another analyze-the-approach-plate-quiz? Not on your spit-shined flight boots! We're talkin' basic knowledge here — 51-37 stuff (well, mostly). That's right, time to dig into the darkest reaches of your grey matter and dredge up some of those obscure facts and formulas you learned when just a pup. Be careful, some question(s) may have more than one answer. Closed book, by the way. Surf's up! Let's go!

1. VASIs are adjusted to coincide with:
   a. runway ILS glidepath intercept point.
   b. runway PAR glidepath intercept point.
   c. the glidepath required from the Visual Descent Point to the runway.
   d. some point other than ILS/PAR glidepath intercept points.

2. Your altimeter can only be adjusted to a pressure setting of 31.00 inches HG. The altimeter setting for your destination is 31.23 inches HG. You will need to adjust your MDA of 1723 ft by:
   a. adding 230 ft to the MDA.
   b. subtracting 230 ft from the MDA.
   c. adding 460 ft to the MDA.
   d. subtracting 460 ft from the MDA.

3. Your altimeter also can only be adjusted to 28.10 inches HG. The altimeter setting at your next destination is 27.63 inches HG. You will need to adjust your MDA of 999 ft by:
   a. adding 470 ft to your MDA.
   b. subtracting 470 ft from your MDA.
   c. adding 940 ft to your MDA.
   d. subtracting 940 ft from your MDA.

4. You're cruising along at 4,000 ft, 3 miles from the nearest VORTAC when your pesky copilot asks, "How fast are we going over the ground, sir?" Since your airplane is only equipped with VOR and TACAN, you perform a groundspeed check by timing for 2 minutes 30 seconds during which you travel 13 miles (according to your TACAN). Is your groundspeed check valid?
   a. No. You're too close to the VORTAC.
   b. Yes.

5. What is your groundspeed?
   a. 156 knots.
   b. 312 knots.
   c. 325 knots.

6. Mix and Match time! Match the type of altitude with the proper definition.

a. Absolute altitude _____.
b. Pressure altitude _____.
c. Density altitude _____.
d. Indicated altitude _____.
e. Calibrated altitude _____.
f. True altitude _____.
g. Flight level _____.

1. Indicated altitude corrected for installation error.
2. A surface of constant pressure related to the Standard Datum Plane.
3. Altitude displayed on the altimeter.
4. Pressure altitude corrected for temperature.
5. Altitude above the terrain directly below the aircraft.
6. Altitude above the Standard Datum Plane.
7. Calibrated altitude corrected for non-standard atmospheric conditions. Actual height above mean sea level.

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7. Which bars of a three-bar VASI should the pilot of a non-jumbo jet follow?

a. The two far bars.
b. The two near bars.
c. The nearest and farthest bars.

8. You're about to begin a PAR and discover your copilot spilled ketchup all over the VVI chart in the approach books while eating lunch. The glideslope is 3° and you figure a 132-knot groundspeed on final. Figure your initial VVI reading.

a. 1320 fpm.
b. 440 fpm
c. 660 fpm.
d. 550 fpm.

9. The weather at your destination was below minimums and you're now on a PAR at your alternate. The glideslope is 2½° and your groundspeed will now be 126 knots. What's your initial VVI now?

a. 730 fpm.
b. 1260 fpm.
c. 630 fpm.
d. 530 fpm.

10. Your true airspeed on final is 150 knots. You have a 28-knot crosswind component. What is your drift/crab angle?

a. 14°
b. 7°
c. 4°
d. 2°

11. Weather at your alternate was also below minimums. You're climbing back to cruise altitude at .70 Mach and 1550 fpm. What pitch attitude change should you make to attain level flight?

a. 2.2°
b. 2.4°
c. 3°
d. 3.6°

Well, how'd you do? We'll leave the evaluation up to you. Maybe you need to brush up on the basics, maybe you don't. Constant review is the only way to keep sharp. Enjoy the summer!

ANSWERS

1. a, b, & d. Ref. AFM 61-37, p. 119.
2. b. Ref. AFM 61-37, p. 80.
3. a. Ref. AFM 61-37, p. 80.
4. b. Checks made under 5,000 ft are valid at any distance.
   Ref. AFM 61-37, p. 72.
5. b. Ref. AFM 61-37, p. 72.
6. a-5
   b-6
   c-4
   d-3
   e-1
   f-7
   g-2
7. b. Ref. AFM 61-37, p. 120.
8. c. Ref. AFM 61-37, p. 114.
9. d. Ref. AFM 61-37, p. 114.
10. b. Angle = (60/TAS) X Crosswind Component.
11. a. Ref. AFM 61-37, p. 19.

The Human Factor

Perceptual Lag

by Anchard F. Zeller, PhD

One way to evaluate human activities in a man-machine setting is to consider the man-machine relation as a closed feedback system. In his part of the system, the man goes through a series of activities which involve perception; that is, acquiring sensory information, making a decision, and performing an action which modifies the function of the machine. The focus of this discussion is a simple human limitation associated with the visual system. It involves time and a distortion of reality which can and has caused accidents. It is ordinarily referred to as perceptual lag.

Most immediate informa-

tion about the world around us is acquired through the sense of sight; a seemingly instantaneous process. For example, when an object is seen, the reflection of a light wave from that object strikes the retina of the eye. Even this process is not truly instantaneous, as light travels at a finite speed of 186,000 miles per second. When distance between stars is considered, this speed can translate into light years; but when a few hundred feet are considered, the time involved, while measurable, is negligible. From the retina of the eye to the portion of the brain (occipital lobe) where sensory input is translated into meaning, the speed of transmission is considerably decreased. This time may vary from 35 to 200 milliseconds (.035 to .200 second), depending on a variety of factors such as intensity, focus, and other things. For example, let's assume that one tenth second (.10 second) is a usable figure. As long as the object viewed is stationary, these time lags are relatively unimportant. When, however, the object is moving, they take on meaning. An object traveling at 15 miles per hour is also moving at 22 ft per second. In other words, in .10 second (our usable time frame), it has traveled 2.2 ft. An object traveling at 45 miles per hour, comparably, is moving 66 ft per second. In .10 second this would equate to 6.6 ft. This fact is of practical importance. Take a duck hunter, for example, who would like to come home with the makings for a tasty meal. The practical importance comes from the fact the duck he shoots flying at 45 miles per hour is not where he sees it at the same time he sees it. It is, keeping with our assumption of one-tenth second for perceptual lag, 6.6 ft in front of where he sees it. If he shoots at what he sees, he will come home with nothing. Practical experience has taught him if he leads the duck, he has a good chance of hitting it. Conventional wisdom suggests this is because it takes time for the shot to get from the gun barrel to the duck. While this is true, another major factor is the displacement in space caused by perceptual lag.

Two automobiles approaching head-on at 60 miles an hour each, have a rate of closure of 120 miles per hour, or 176 ft per second. At these speeds, they've travelled 17.6 ft during the one-tenth second required for nerve passage. From the eye of either of the drivers then, the cars appear to be 17.6 ft farther apart than they actually are; an error of this magnitude can be critical. Part of the process of learning to drive is learning, usually without knowing why, to accommodate for the differences between what is seen and what is actually happening.

In the process of flying, the distances are multiplied by ten. Rather than 120 miles per hour rates of closure, 1200 miles per hour or greater are possible. The 17.6 ft grows to 176 ft. The implication is obvious. This "human design limitation" has undoubtedly been a factor in midair collisions.

In our discussion, it's important to remember we've considered only the time involved in transmitting a light impulse to the eye and from the eye to the occipital (seeing) part of the brain. We haven't discussed the processing time required to convert sensory impressions into meaning which precedes the rest of the human cycle (perception, decision, and action) which eventually ends up with action. This, however, isn't a part of perceptual lag.

For an evaluation of perceptual lag itself, there are several important conclusions. One of these is the human being is a designed mechanism, even as mechanical equipment is designed, and understanding design limitations is essential in considering man-machine evaluations. A related implication is failure to appreciate the fact human limitations can cause accidents, and understanding them can sometimes cast light on events which otherwise have no rational explanation.

If you want to forget all the preceding, just remember—if you are shooting at a duck or pheasant and you want to hit it, you shoot where you don't see it, because that's where it is. If you shoot where you see it, you won't hit it, because that's where it isn't. *That's where it was.* In flight, when an aircraft is approaching head on, keep in mind it's even closer to you than it looks.

Courtesy: USAF Safety Journal

FOWL MEETINGS

by Lt. Col. Michael G. May and Capt. Donald L. Rosenberry

As hard as it might be to believe, we're halfway there. Welcome to the sixth segment in our series. This month we've two issues to discuss; some of those "ancillary requirements" outlined in AFR-127-2 and AFR 127-15, The Bird Strike Hazard Reduction Program. You know, all those things you're supposed to do between reporting, investigating, monitoring, inspecting, and educating. It's a big area to cover in one article, so let's dig out the old AFR 127-2 and get cracking. But what's this, a *brand new* AFR 127-2!? Yes, we're right on top of things now. Here it's been on the streets less than six months and we're already reviewing it. Not bad eh? But let's get to work, shall we? Specifically, the work outlined in chapter 13—Flight Safety.

Face it—this looks ominous! How can anyone possibly manage to cover all these areas on a continuous basis? The answer is to keep careful track of how these responsibilities are being run, and use common sense. Let's look at a few areas listed as items for FSOs to monitor or spot inspect.

• High interest areas —We haven't started and we need a definition. Well, the regulation defines these as "Work areas or operations which need additional attention or inspections because of increased mishap potential due to the nature of work performed, physical conditions, or type of materials handled. These areas are designated by higher headquarters or installation officials." From MAC you have two: The flightline and firefighting. However, *you* may want to designate other areas or operations high interest. We've seen this technique used on everything from drop zones (manned by aircrew trained as DZCOs) to local weather penetration procedures (newly developed) to low-level routes (in juxtaposition with dense air traffic areas). This can be a very effective follow-up device. It makes sense then, if an area can be designated high interest by you, when the problem is resolved, you can *un*designate it (isn't English wonderful?).

• Life support facilities and training programs. What better way to 'monitor' the training programs portion of this event than by experiencing it? This also provides another reason to pay careful attention to training. The facilities portion can be spot-inspected during your monthly helmet checks (if you're helmet-equipped) or in a more formal way, by *accompanying* your ground safety officer during his inspection (what a novel idea). If you schedule it right, you can probably evaluate the collateral duty safety program at the same time.

Low-level routes and drop zones—again an easy one. Simply take a close look at the routes and drop zones when flying them, and listen to your crew and other crews in the formation. Instead of complaining at the end (something really *should* be done), write up all those unsafe conditions. Not only will it fulfill this requirement for your safety program, it'll give you a tremendous head start on investigating any problems you identify. Sometimes identification of the problem and its resolution are only a phone call apart, but that's okay, it's still "monitoring" them, and effectively too.

Unit and transient aircraft maintenance operations. *This one can cause heartburn if acted on improperly, or be a tremendous boost to your program if done well.* The key to executing this one is *rapport.* If you don't have any with the maintenance folks, you're already behind the power curve. Chances are though, your ground safety staff does (they spend a lot of time with maintenance troops

by necessity). Tag along, get to know the people who work the shifts, it'll pay off in several ways. If the only time you show up is to investigate a mishap, don't expect a warm welcome. But as with any endeavor, if you get to know the men and women doing the job, *you'll* learn a lot, they'll gain a different perspective on you, and you'll have great chance to do some PR work for safety while fostering a greater ops/maintenance team effort all around. Sound grandiose? Try it!

Assigned and attached unit flight facilities, briefings and meetings. What a great excuse to fly! It's the simplest way to get this whole area resolved, and it puts you in a great position, communicating with aircrew.

Airfield manager's daily inspection. While you may have to come in a bit earlier than usual, this one will really pay off. Of all the folks you need to get to know well, airfield management can be some of the best. In addition to logging off yet another of the responsibilities, you'll learn a lot about the airfield from a practical point of view. In addition, you can log off the next eight listed items in this one visit (items l through s on page 32).

The other areas suggested in this chapter have been or soon will be the subject of a separate article for analysis, except paragraph 13-12. With arguably one of the most entertaining titles in any regulation, Other Activities Related to Flight Safety, this paragraph lists three meetings the FSO should attend. We feel these can be very profitable. Yes, they consume time, but for a purpose.

You need to know something more about ATC than that they exist. The ATC board meeting is a great place to meet these professionals, and learn about their concerns. It's also a forum for raising your concerns about ATC.

The FOD prevention committee meeting, in addition to keeping you, and therefore flightcrews, abreast of FOD concerns, is another method of meeting with your maintenance experts.

Finally, standardization, evaluation, and training meetings draw a very active group of folks together at one place, a great means of gathering and disseminating flight safety concerns. Laying out all requirements, one by one, you'll probably be surprised to discover it is a manageable list. Naturally, common sense dictates flexibility since between all these duties are reporting and investigating responsibilities. But, by having a schedule, a plan of attack for all the areas, you'll be more effectively using time not spent investigating or reporting, and you're much less likely to miss major program elements. Without it, it's pretty easy to forget a specific item, given the overall workload. The new AFR 127-2 does an admirable job of collocating your responsibilities in an effort to help you manage your flight safety program.

We promised a two-part article, and it's time to move on, so let's get right to it. The first thing you're likely to notice about AFR 127-15 is the regulation itself is only four pages long, while there are 14 pages of attachments. The usual scenario is a review of the regulation, then on to other pressing issues (like some of the other volumes of regulations). For grins, why not drag out your copy and follow along? There is a change to the very first section. The BASH team isn't in Florida anymore. Their current address is:

HQ USAF/LEEVN
BOLLING AFB, DC
20332-5000

The terms defined in the second section serve an excellent purpose, familiarity with them can make reading other treatises on bird problems a much more successful effort. A primary interest for you is the definition of Bird Watch Condition Codes; a sharp topic to disseminate to aircrews. Your base might not have a problem great enough to use these terms frequently, but other bases do, and your crews need to know what the codes mean, or the information, designed to reduce risk, won't help them. After the terms section, the next one that applies to you base level fliers and FSOs is Section Four, Developing an Effective Bird Strike Hazard Reduction Program.

This three-paragraph section is the meat of the regulation, yet it is quite broad in wording. There's an excellent reason for that. The birdstrike threat is as varied as base environments. To go into specifics, the author would need to write a program for each base, with an attachment for seasonal variations, and that still wouldn't account for local man-made environmental changes. In short, only someone at a base can develop an effective program for that base, at that time.

The next section describes birdstrike reporting. This isn't a complex description; if the strike caused reportable damage, report it IAW AFR 127-4. For "non-damaging" bird strikes (which includes damage below reporting thresholds), it prescribes AF Form 853, a cumulative repository of information sent semi-annually to the BASH team for a data base. This *is* important. While anything which can be put off for a while tends to be classified "not hot," we hurt ourselves if we fail to accurately report our birdstrike experience. The solution to any problem begins with defining it, and bird hazards are no different. Because this problem deals with a

living, highly mobile creature of incredible variation, the answers can be quite complex.

Even if you have trouble identifying Toucans, you can help determine the identity of a problem fowl. So, just for conversational purposes, let's say you didn't major in ornithology; how do you find out what to do?

That question leads us nicely to Section Six, Technical Assistance. The BASH team is our primary source of avian expertise in the Air Force. Keeping in mind their new address, you can contact them for assistance if you find your bird problem more than you can handle. This section also mentions the attachments, where you can find state wildlife agencies, universities, and other private organizations which may help you assess the bird problem in your area.

Attachment 1 contains a useful explanation of what the bird threat is, how to identify the hazard, some control methods (active and passive), a section on operational factors one should consider to reduce birdstrike risks, and a list of technical assistance sources.

In addition to writing the BASH team, you can also *call* them at AV 297-6242/6243/6244, however, any request for assistance requiring travel must be made by message or letter. That doesn't mean they are only there to disseminate charts or assist in a last chance effort to solve a problem gone out of control. In fact, it's much better to call them *before* birdstrikes become a critical factor. You can call, explain the problem, and they'll be happy to provide advice over the phone. They'll also be assessing the problem to determine if your facility has a problem they might more adequately evaluate on-scene. If so, they'll ask you to formally request assistance (message or letter) and get started. The good news is; if they consider you have a problem they should help with, *they* pay for the visit.

There's some information the BASH folks want you to know. First, there is *no* data supporting the use of eye spots on turbine inlets as an effective bird deterrent despite the famous use of this tactic by Japan Airlines. Therefore, they don't need any more suggestions on this subject (they've been inundated with this suggestion since the story first received media interest). However, if you plan to implement this program, they will fully support your effort and will help develop methods to document research information you gather.

They want very much to hear about *every* birdstrike. It really is important to log all birdstrikes (via Forms 853). This information provides a database; the larger the database, the more accurate and meaningful statistical analysis can be. This requires a dedicated effort not only by FSOs, but everyone associated with aircraft. From the flightcrew experiencing a birdstrike to the crewchief who finds evidence of a birdstrike long after a flight, anyone who suspects a birdstrike should report it to the safety officer for inclusion on the AF Form 853. In addition, the more information about each flight incurring a birdstrike, the more meaningful the information will be. The single most important piece of information is bird identification. If you can do it—great! If not, send any portion of the feathers you can recover. They frown on shipping the larger remains, as the condition they arrive in usually isn't too pristine, and the identification is usually made from the feathers anyway. This requires some expansion. It isn't necessary to have a piece of feather large enough that you or I can match it with a photograph, the process is considerably more sophisticated, with identification accomplished via electron microscopy in some cases. The bottom line is if you can recover portions of feathers, it is worth sending.

They have some notes for mishap investigators: Unless birdstrikes can be positively eliminated as a source of problems in a mishap, you should contact the BASH team. There are documented cases of mishaps attributed to one cause, only to discover later the real cause was engine failure due to bird ingestion. The reason to call the team early in the investigation is there's a tremendous potential for losing evidence, or disassociating the evidence from the mishap (as when a mishap site is washed down). They represent the corporate knowledge concerning means to preserve evidence, as well as the source for determining bird involvement.

The BASH team would like you to know they're expanding their efforts in several areas. They're working hard to develop procedures which will help us on low-level routes, in addition to the advice in attachment 1 to AFR 127-15. They're also looking at problems encountered at overseas locations. In both cases, the key to success is reporting, and you hold that key. Finally, they are holding their second BASH conference at Norton AFB July 21-23. They encourage anyone with a bird strike reduction interest to attend, but they need to know who's going to attend. If you plan to, send them a message with name, rank, and organization so they can confirm the number of attendees. As an intentional teaser, one of the topics they'll discuss is the effects of strobe lights as a bird deterrent. It might interest you to know research suggests red strobes attract birds, and white ones are ignored by our fowl friends. And this is but one conference topic. ✈

NONDAMAGING BIRD STRIKE REPORT

REPORT CONTROL SYMBOL

TO:

FROM:

PERIOD OF REPORT

	INCIDENT	INCIDENT	INCIDENT	INCIDENT
1. MONTH AND DAY				
2. LOCAL TIME				
3. LIGHT CONDITIONS *(Bright, dull, etc.)*				
4. AIRCRAFT MODEL, DESIGN, AND SERIES				
5. LANDING LIGHTS *(On or off)*				
6. STROBE LIGHTS *(On or off)*				
7. PHASE OF FLIGHT *(TO, climb, low level, etc.)*				
8. AIRCRAFT SPEED *(KIAS)*				
9. ALTITUDE AGL				
10. FLIGHT PATH IN RELATION TO CLOUDS				
11. GEOGRAPHIC LOCATION *(Lat and Long)*				
12. BIRD SPECIES *(If known)*				
13. NUMBER OF BIRDS *(Single or flock)*				
14. IMPACT POINT ON AIRCRAFT				
15. ESTIMATED COST OF DAMAGE				
16. BASE IDENTIFIER *(ICAO)*				
17. PILOT WARNING *(Yes or No)*				
18. LOW LEVEL ROUTE NUMBER *(If applicable)*				
19. REMARKS				

AF FORM NOV 84 853

U.S. G.P.O. 1984-460-983/23270

Low—Level KILLER

Is it waiting for you?

"Center, Mogul 53, we're canceling IFR and descending to route altitude. Estimate exit at 1559Z."

"Roger, Mogul 53. Call us back on this frequency upon exit."

"Mogul 53, Roger."

"Okay. Co, Nav, we need to fly this route as close to flight plan as possible; you know why," said Mac MacKenzie to his copilot, Capt. Mike McConagle and navigator, Capt. Caesar Ramirez.

"Right boss, your first turn point comes up in a minute and thirty seconds for a turn to 134°," replied Caesar.

"You're also fifty feet high, pilot. If you want precision, fly that way," interjected Mike.

"Right. This rough air isn't making it easy. Those weather forecasts are right on the money about the turbulence."

"Ten seconds to turn—three, two, one, turn now!" directed the Nav, as they reached the first turn point exactly on time.

"Turning, and rolling out on 134°."

"I haven't gotten sick on one of these missions before, but there could always be a first time," said Mike, half jokingly holding an airsickness bag up to his mouth.

"Don't worry Co, if everything goes as planned, you won't have to suffer much longer," replied Mac with a surprisingly hard edge to his voice.

"Pilot, our next turn point is two minutes away, opposite that butte we were told about, just past that series of ridges at our 12 o'clock."

"Roger Nav, the ridges are passing under, coming opposite the butte now, we're doing okay so . . . hey, what the . . . firewall all four, help me get the nose up . . . we're rolling . . . . "

"Passing three hundred feet, bring her up . . . roll it back . . . ."

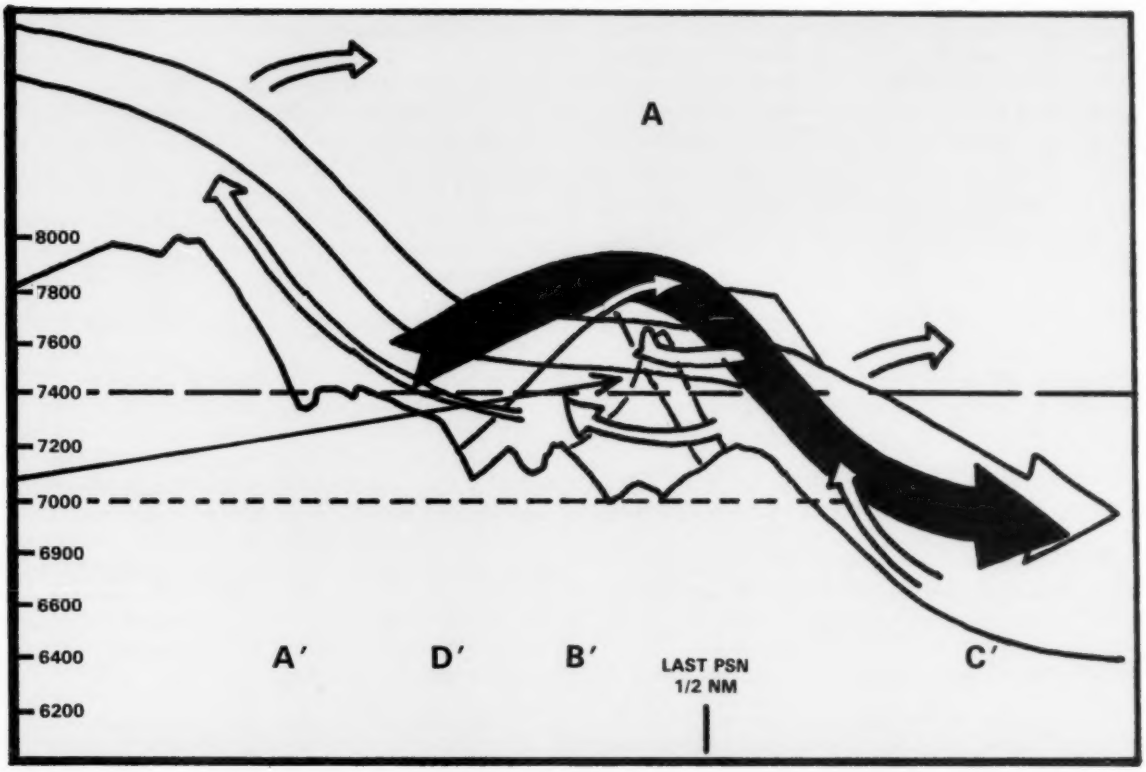
"I can't get . . . we're going . . . ."

"Well, MacKenzie, what do you think now?" asked the burly major, leaning on the lectern in the front of the briefing room.

"I wouldn't have believed it if I hadn't seen it, Major Steppe. How'd you get the simulator to reproduce conditions like that?"

"Getting the computers to reproduce the visuals and winds isn't all that tough anymore, but that's not the reason you took the ride, is it?"

"No. You've given me a look at one of the hazards of the low-level environment I came to the



schoolhouse to look at. But what *exactly* happened to us in there? I've never felt so helpless in my life."

"Well, I thought you'd ask that question, so I got together some information from a low-level turbulence study. As a matter of fact, they're the same conditions you just 'flew' through.

"Conditions at the time of the study were deceptively good. Practically unlimited visibility, scattered clouds at 5,000 feet AGL, but the winds were from the southwest at 25 to 40 knots, generating moderate to severe turbulence with terrain-induced vertical velocities of 10 to 25 knots."

"What do you mean terrain-induced?" asked Mike.

"When numerous obstacles block the wind's path, in this case mountains and ridges, normal wind flow is transformed into a vastly complicated snarl of eddies, similar to rapids in a stream, only vastly more complex. The degree of turbulence depends on terrain roughness, wind speed, and degree of air mass stability. In an area of rough terrain, like our simulation today, there's a great variance of both wind speed and direction, with brief, sudden, and irregular periods of low speeds or lulls, and high speeds, such as the gusts you hit today. Speed tends to increase as the average speed of the general wind flow increases.

"The study determined a prevailing wind over the terrain of 25 to 40 knots. Also, when the measurements were taken, atmospheric stability conditions enhanced the flow over the ridges by 25 to 30 percent. As the flow increased over the mountain peaks, the accompanying pressure drop induced upslope winds of the same magnitude as the prevailing wind, only in the opposite direction. You can see the various wind vectors on this slide."

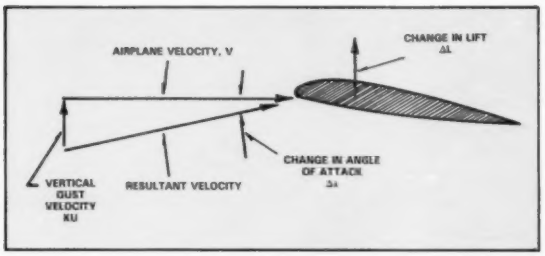
"Okay, I can see that, but it's still hard to believe I wasn't able to recover in the simulator."

"Losing your right wing may have had something to do with that."

"What?"

"That's right. Remember, air gusts impose both horizontal and vertical gusts on an aircraft in flight. They're most severe when you're flying parallel to mountain ranges on the downwind side with air flow

moving perpendicular to the range. Up-gust conditions result, naturally, when you encounter vertical upward gusts. This increases the wing's effective angle of attack which not only increases lift on the wing, but also increases wing loading. This slide depicts the relationship."

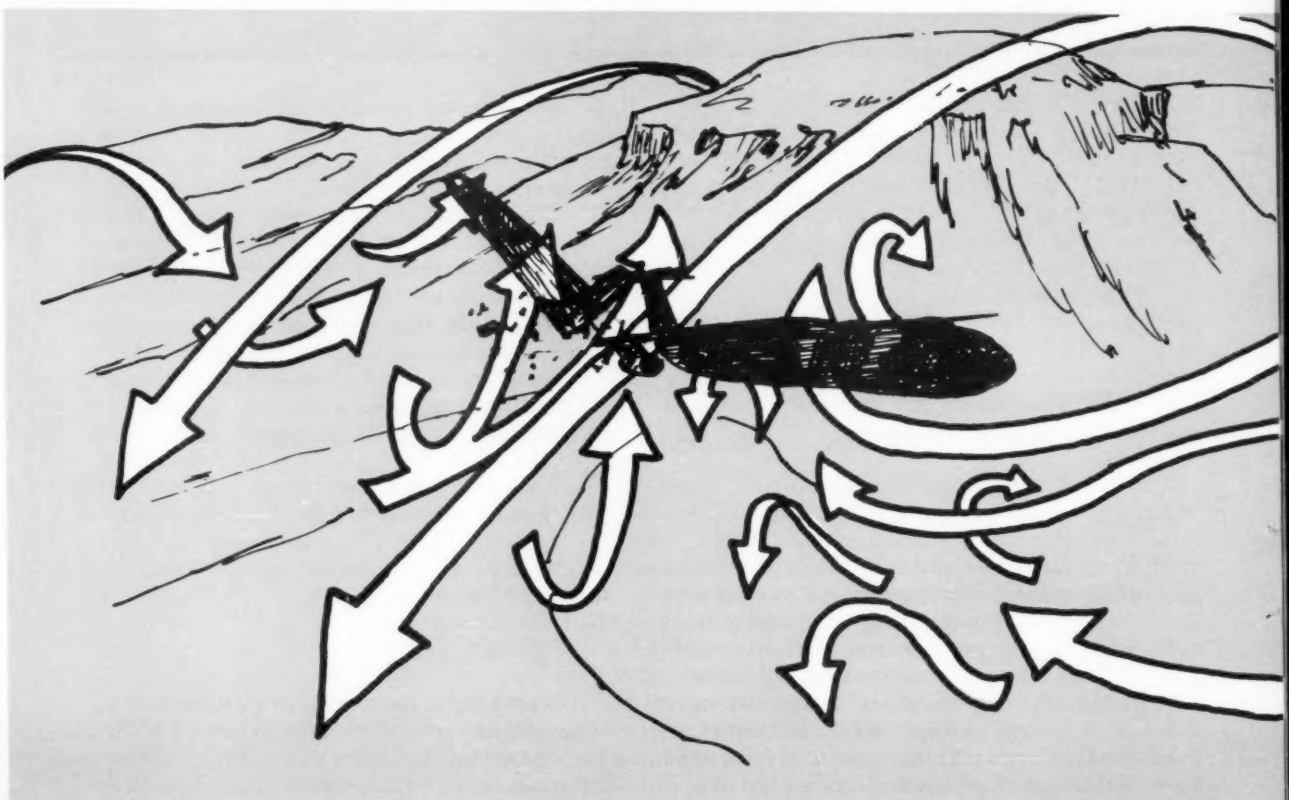


"That doesn't give any values, but a few numbers will make it clear. Severe turbulence is characterized by vertical gust velocities of 35 to 50 feet per second, which relates to a vertical velocity of 2,100 to 3,000 feet per minute. Your 'aircraft' hit a down draft of more than 50 feet per second, very likely under the conditions we set up. You pulled back on the yoke to counter the resulting rate of descent and then you were slammed by another, equal gust, but in the opposite direction. In less than one second you overloaded, 'over G-ed' the wing, and it failed.

"The slope of the terrain in the area where you 'bought it' supported vertical velocities from 10 to 21 knots, based on 40-knot winds over the ground. With gusts up to 50 knots, you could easily experience vertical velocities up to 25 knots. Certain areas can induce velocities of more than 30 knots or 50 ft per second."

"What should we do? We can't stop flying low-level."

"You're right, Caesar. What you can do is understand the phenomenon, and analyze your routes in relation to prevailing winds to get a good feel for turbulence you can expect during each flight. A mountainous area gets a lot of turbulence forecasts that sometimes develop, sometimes don't. Or, it may not be as bad as expected. You just can't let yourself get complacent about it. Don't brush off a forecast as just 'the same old thing,' or 'it's never as bad as they say.' Do that once too often, you could learn your lesson this way."



Excellence In Airmanship

Capt. Richard T. Devereaux and crew, 75 MAS, Travis AFB, California, were flying a local training flight on 24 Jan 1987. Shortly after takeoff, Captain Devereaux, in the right seat, observed a flock of about 50 seagulls in their flight path. Seconds later, several loud thumps were heard as numerous birds impacted the aircraft and entered the number 3 and 4 engines. Capt. Jack E. Harden, in the left seat, maintained control of the now-shuddering aircraft and guided it into the 300-foot overcast. Passing 800 ft, the flight engineer confirmed through the aircraft MADAR that number 4 engine was vibrating severely and beginning to disintegrate. The second engineer visually observed number 4 engine shaking several feet side to side. Captain Devereaux assumed control of the aircraft and called for the appropriate engine shutdown checklist. After shutting down number 4, he continued to fly the aircraft and coordinated an emergency return to Travis. With the aircraft now flying in weather on three engines, the crew completed their emergency checklist procedure and turned the aircraft to a downwind leg. Capt. David J. Mason, in the jump seat, quickly relayed their emergency situation to the local MAC Command Post and suggested they cancel all launches immediately due to an extreme bird hazard. As the pilots turned the aircraft on a modified base leg, the flight engineer advised number 3 engine vibrations were increasing, causing the aircraft to shake noticeably. Captain Devereaux quickly briefed the crew on two-engine procedures in case the vibrating engine began to disintegrate and had to be shut down. As the aircraft turned final, the flight engineer informed the pilots number 3 engine vibrations were approaching shutdown limits. Approach control advised weather was deteriorating with a 200-foot ceiling, one and one-half mile visibility, light drizzle, and fog. As the C-5 approached decision height, the runway came into view and Captain Devereaux guided the aircraft to a perfect landing. On landing roll, the flight engineer advised the pilots number 3 was now vibrating out of limits and recommended immediate engine shutdown. The crew quickly cleared the runway and shut down the engine. After ensuring emergency vehicles were in position and no fuel or hydraulic fluid was leaking from the operating engines, the pilots shut down the remaining engines and the crew safely egressed the aircraft. Post-flight inspection revealed extensive damage to both numbers 3 and 4 engine stator and compressor sections as well as shrapnel damage to engine cowlings and the fuselage. Captain Devereaux and crew exhibited outstanding professionalism and crew coordination during this emergency and their actions deserve award of the Excellence in Airmanship. Congratulations from the *TMF* staff on a job very well done. ★

Left to Right, Capt. Jack E. Harden, CP, Capt. Richard T. Devereaux, IP, SSgt. Darrell L. Reynolds, FE, TSgt. Robert P. Gildert, FE, Kneeling, Maj. William J. Brown, CP, Capt. David J. Mason. CP.

Flying-Hour Milestones

10,000

MSgt. Edgar A. Nill, 96 TAS
MSgt. Dennis W. Stoneman, 16 TATS
TSgt. Jose R. Guiterrez, 772 TAS

5,000

Col. James M. Lacy, 21 AF/SE
Lt. Col. William R. Blackmon, Det 5, 1400 MAS
Lt. Col. Roger J. Korenberg, 41 ARRS
Maj. Robert L. Edly, 6 MAS
Maj. Dennis P. McEneany, 16 TATS
Maj. Charles F. McLucas, III., 9 MAS
Maj. James P. Moulton, 67 ARRS
Capt. Michael A. Del Pinto, 76 MAS
MSgt. Bobby J. Dalton, 5 MAPS
MSgt. Gary D. Evans, 21 AF/DOVA
MSgt. Joseph W. Goheens, Jr., 39 TAS
MSgt. Harvey B. Long, 7 SOS
MSgt. Antonio Reyes, 16 TATS
TSgt. Thomas F. Becker, 22 MAS
TSgt. Robert D. Chunn, 17 TAS
TSgt. Douglas W. Dyer, 16 TATS
TSgt. Randolph G. Grensavitch, 39 TAS
TSgt. Kenneth M. Hall, 6 MAS
TSgt. Elva S. Hathorn, Jr., 18 MAS
TSgt. Jorge L. Martinez, 39 TAS
TSgt. Mark A. Moran, 6 MA
TSgt. Cecil W. Whaley, 18 MAS
SSgt. George F. Engelhardt, 16 TATS
SSgt. Randall A. Morris, 18 MAS
SSgt. Frank A. Thompson, Jr., Det 4, 40 ARRS
SSgt. John F. Wells, 39 TAS
SSgt. Ian J. West, 16 TATS

2,500

SSgt. William L. Ash, 1550 FTS
SSgt. Steven M. Bertrand, 71 ARRS

Ranks and units are those at time of award. See MACR 900-3 for details on how to apply for your own milestone award. ★

Weather Warnings

Forewarned is forearmed.

by Maj John F. Phillips
Chief, Scientific Services Branch
HQ, 7th Weather Wing

Transiting Lajes Air Base can be extremely hazardous unless you're prepared. Located on the Island of Terceira, the Lajes runway is oriented southeast/northwest. Just two miles to the west, terrain rises to 3,000-4,000 feet. With a prevailing southwesterly wind, a "venturi effect" produced by the mountains creates an extremely hazardous crosswind problem. How often can you expect to encounter it and what do the weather guys do to alert you, the aircrew, about this problem?

Hazardous winds can occur any month of the year. The maximum wind velocity recorded on the Lajes runway was 90 knots and occurred in February. However, winds in excess of 60 knots have been recorded 8 months of the year. Due to the channeling effect of the mountains, winds at various points on the runway are often quite different when the wind is from the southwest. To measure these differences, wind measuring anemometers are positioned at the center and both ends of the runway. In addition, another anemometer is located on the control tower about 200 ft above the runway. These instruments show winds vary along the length of the runway, and winds 200 ft above the runway can be up to 1.8 times stronger than those on the runway. Sound like a wind shear situation? You bet!

How often can you expect to see these winds at Lajes? In 1985, 84 weather warnings were verified for winds in excess of 50 knots. That's about one event every four days. Looking at it another way, crosswinds in excess of 24 knots occur 1-2 percent of the time, except for February when this event occurs nearly 7 percent of the time. The average enroute time from the CONUS or Europe into Lajes is from 5 to 8 hours, com-

Fig. 1 The Azores Island, relative size and location.

Fig. 2 Planview of Terceira Island.

Fig. 3 Planview of Terceira Island with winds rerouted through the valleys.

pounding the forecaster's problem, so a long forecasting lead time is needed. Santa Maria is the only other nearby airfield capable of handling MAC aircraft and with both Lajes and Santa Maria unuseable due to cross winds 1.5 percent of the time, the weather guys saw a real need for a method to alert in-bound crews of potential problems.

The weather folks at Lajes worked hard to identify weather patterns capable of producing strong wind situations. The results of this hard work are some very reliable rules used by Lajes forecasters to alert in-bound crews of a potentially hazardous situation. When the situation warrants, Lajes forecasters add the remark "STG SW WND PSBL" (Strong Southwest Winds Possible) to their internationally transmitted terminal forecast. Additionally, they initiate a "Weather Watch" program that alerts base personnel conditions are favorable for a strong wind event. The Department of Defense European Flight Information Publication now alerts aircrews to these procedures when hazardous winds are expected. Strong Southwest Winds Possible (STG SW WND PSBL) means surface winds, significantly stronger than forecast, may be encountered upon arrival at Lajes. This also means you can expect low-level windshear and turbulence. Common sense dictates aircrews should *file an alternate outside the Azores* when this remark is present in the forecast.

Air Weather Service forecasters are working hard to improve service to aircrews and flight safety. Since the Lajes weather folks began putting the "STG SW WND PSBL" remark in their terminal forecast, there hasn't been a high wind event when the remark wasn't used. Think about this the next time you head across the pond!

Fire Hazard?

Quite the contrary.

But it's toxic! I've heard that statement about the halon fire extinguisher more than once. Yes, it is toxic, but the degree is very slight; while the possibility of major damage from a fire—should someone hesitate using the extinguisher—is very great. I've written this article to help dismiss some unfounded fears associated with halon fire extinguishers.

Halon extinguishing mechanisms are not clearly understood. However, there is undoubtedly a chemical reaction which interferes with the combustion process. It does this extremely well; in fact, it is approximately two and one half times more efficient than the older model carbon dioxide extinguishers.

Halon is very easy to use and may be used on almost any fire. You merely pull the pin, aim the nozzle, and spray the base of the fire with a slow, fan-like motion. If an individual is on fire, don't hesitate to spray halon on the person. Halon has a cooling effect which helps minimize damage. Should you get halon in someone's eyes, get them to the hospital as soon as possible to have their eyes treated.

Is halon toxic? It must be, it's printed right on the bottle. But— how toxic is it? How it affects you is determined by the overall concentration you're exposed to.

—Concentrations up to 9 percent by volume have no effect.

—Ten to 20 percent may give you a loss of dexterity and cause possible confusion.

—Concentrations above 20 percent may cause death if exposure lasts more than a few minutes.

Those volumes sound relatively high, but if you consider it takes 6 to 7 percent by volume to extinguish a fire, you see it isn't all that high. For example, if you have a fire in the cab of a truck and use a 3-pound halon extinguisher, you would have a concentration of less than 2 percent at nose level. Remember, when halon first came out, OSHA administrators declared it the least toxic fire extinguisher on the market.

So, if you see a situation requiring use of a halon fire extinguisher, don't hesitate! You can be the big hero and save the day—rather than the person who hesitated because he didn't understand.

by Capt. John H. Fitzgerald
1550 CCTW
Kirtland AFB, New Mexico

The "Eyes" Have It

The real reasons aviators shouldn't wear contacts.

by Capt. Donald L. Rosenberry
Associate Editor

Even as you read this story, a great controversy rages within the military aviation community. At the heart of the conflict is the hotly debated use of contact lenses by aircrew. The issue penetrates much deeper than vain cosmetic appeal or preference for convenience, with possible effects ranging from readiness to budget. A final decision in the matter is already in place, as wear/use of contact lenses by aircrew members is expressly prohibited in AFR 160-43, paragraph 7-8B(5). But that doesn't mean the case is closed forever, as studies regarding use of these lenses continue.

Instead of just leaving it at that, we thought it might be interesting to look into some of the rationale on both sides of the topic, since it is an issue which impacts increasing percentages of Air Force aviators. Today, some 20 percent of Air Force pilots wear eyeglasses, at least part of the time, and the percentage is up to 50 percent or higher in other crew positions. These percentages represent a large number of people, a much higher percent than in the early days of manned flight. Spectacles weren't unheard of, however, even in aviation's infancy.

Doctors have prescribed corrective lenses of various types for military and civilian aviators for over 40 years. They've proven an excellent means of retaining trained crewmembers whose vision worsens after initial training, and vastly expands the recruiting base for aviation, allowing more than just those with 20/20 vision to apply. Eyeglasses provide reliable, stable correction of central vision for both near and farsightedness, but they're not a panacea; there are problem areas.

In fact, I'd wager the search for a better way to correct aviators' (and the rest of eyeglass wearers) vision has been in progress as long as spectacles have been in use. One problem, unique to military aviation, is width of spectacle frames—and therefore size of the lenses. Width is limited by compatibility with a helmet. Consequently, lenses usually feel "too small," particularly to those who don't wear them constantly. But there's more; usually, one removes glasses before donning a helmet. This doesn't help in the race with "time of useful consciousness." In addition, the effort to wear glasses *over* an oxygen mask is an entertaining one, at best.

All spectacles, however large the lenses, limit the field of fully corrected vision and leave an uncorrected area in peripheral fields when extreme eye movements are used. This distraction is most aggravating to those who wear glasses occasionally. These defects are impossible to correct, both anatomically and optically.

Other troubles include the material lenses are crafted from. Plastic safety lenses scratch easier than glass and mist readily in hot or damp environments. There are optical and manufacturing difficulties in dispensing certain lenses, particularly bifocals, when overhead instruments have to be read.

There are ergonomic problems as well. Ask anyone who's flown a long mission while the ordinary, seemingly innocent headset grinds the earpieces of the glasses into their skull.

Regular glasses are all but totally incompatible with some newer personal equipment, like night vision goggles or chemical protection gear.

Eyeglasses not fastened with a strap can "depart the fix" at most inopportune times due to sudden, violent movements (turbulence, reflexive recoil from a near birdstrike, etc).

There is also a logistical

penalty for wearing glasses. One must normally keep two pairs, both clear and optically protective, for TDYs and deployments. Further, the medical community must have an enormous capability to produce, prescribe, or replace spectacles in austere conditions, when the availability of "downtown merchants" is limited.

CONTACT LENSES--THE ANSWER?

Considering the many difficulties with eyeglasses, there must be a solution by now, right? One seemingly obvious answer appears to be replacing spectacles with contact lenses. Contact lenses seem to solve almost all difficulties.

- They correct the entire visual field with two options; the large lenses which cover the whole eye and the small micro-corneal types. This permits the same freedom of vision as one without corrective lenses.
- Similarly, there's no compatibility problem with helmets or any other personal protective equipment, since they fit in the eye. Therefore, they don't physically interfere with any equipment we use.
- They don't mist when entering an environment of widely varying temperature and humidity.
- Contact lenses aren't likely to fall out, regardless of turbulence.
- They don't contact any other part of the body, thus eliminating discomfort sometimes experienced across the bridge of the nose or behind the ears.

If this were the end of this story, all of us who wear glasses could beat feet to the nearest optometry clinic and place our orders right now—but it isn't over. There are problems with contact lenses as well.

The biggest reason contact lenses aren't approved for aircrew use is uncertainty of their effect in the aviation environment. This may seem a bit unrealistic, so let's look as objectively at contact lenses as we did spectacles.

The process of initial fitting for contact lenses is more complicated than for spectacles. In addition to the usual examination a spectacle wearer is used to, the eye doctor takes additional measurements, including the shape and curvature of your cornea. Existing eyeglass prescriptions can't be used for contacts. Even after fitting is complete, the follow-up care for contact lenses is more involved. With glasses, the person picks them up and, after fitting the frame, is off and running. With contacts, wear must be monitored carefully, as these lenses are actually touching the eye. The potential for serious eye injuries such as corneal ulcers and even loss of vision is rare, but real. Often, initial lenses will have to be changed to insure good vision and proper fit. After this test period the doctor can prescribe final contact lenses.

- The operational readiness side of the question centers around a concern that most contacts can't be worn at night, or continuously. Since a crew on alert would take slightly longer to insert contact lenses than don a pair of spectacles, this is not a plus.
- Aftercare isn't limited to visits to the optometrist's office. The individual has to care for the lenses as well, once he/she has the right ones. Currently, all contact lenses have to be removed and cared for at some interval (even "permanent" lenses aren't, really).
- There are other problems for aircrew, too. We know that dust tracking behind a lens can produce a painful corneal abrasion, which requires crewmembers be grounded until healing is complete.

• Yet another difficulty relates to the oxygen transfer properties of the lens itself. Without adequate transfer of oxygen from the atmosphere to the anterior cornea, an accumulation of breakdown products can occur which can lead to corneal swelling. This results in a condition know as "spectacle blur." Spectacle blur can reduce visual acuity with contacts or glasses considerably; the blur frequently persists in some degree for up to five days.

• We're not done yet. The gases dissolved in the fluids of the eye may produce bubbles, should the cabin altitude exceed 6,000 ft, which might reduce vision. Once the bubbles form, they could produce corneal abrasions if the lenses aren't promptly removed.

• There's also the problem of individual tolerance to contact lenses. Although a number of crewmembers can wear them satisfactorily for acceptable lengths of time, variance in length of wear can be quite extreme.

• Under field conditions, too, sterilizing lenses can be a problem. Replacement of a lens, for whatever reason, requires attendance at a specially and expensively equipped center, instead of a normal opthalmic department.

So far, everything I've pointed out applies equally to all types of lenses, and that's not entirely fair, since we now have a new type of lens.

"SOFT" LENSES

In recent years, hydrophilic, or "soft," contact lenses were developed which do away with some of the above difficulties; tolerance is easier to acquire, there is less risk of dust injury and, because of better oxygen transfer, "spectacle blur" may not occur.

However, these lenses still have problems. Fitting is more time-consuming as precise lens geometry is difficult to achieve in a hydrophilic gel. A number of trial lenses may be needed to achieve the high standard of vision required of aircrew members. As lenses conform to cornea curvature, they may not correct astigmatism (unequal curvature in two meridians); most soft lenses have to be removed, cleaned, and sterilized daily and, being thin and soft, are more liable to damage, thus having a short lifespan, sometimes only a matter of months. They need renewal more frequently than spectacles, which adds considerably to the cost of correcting vision.

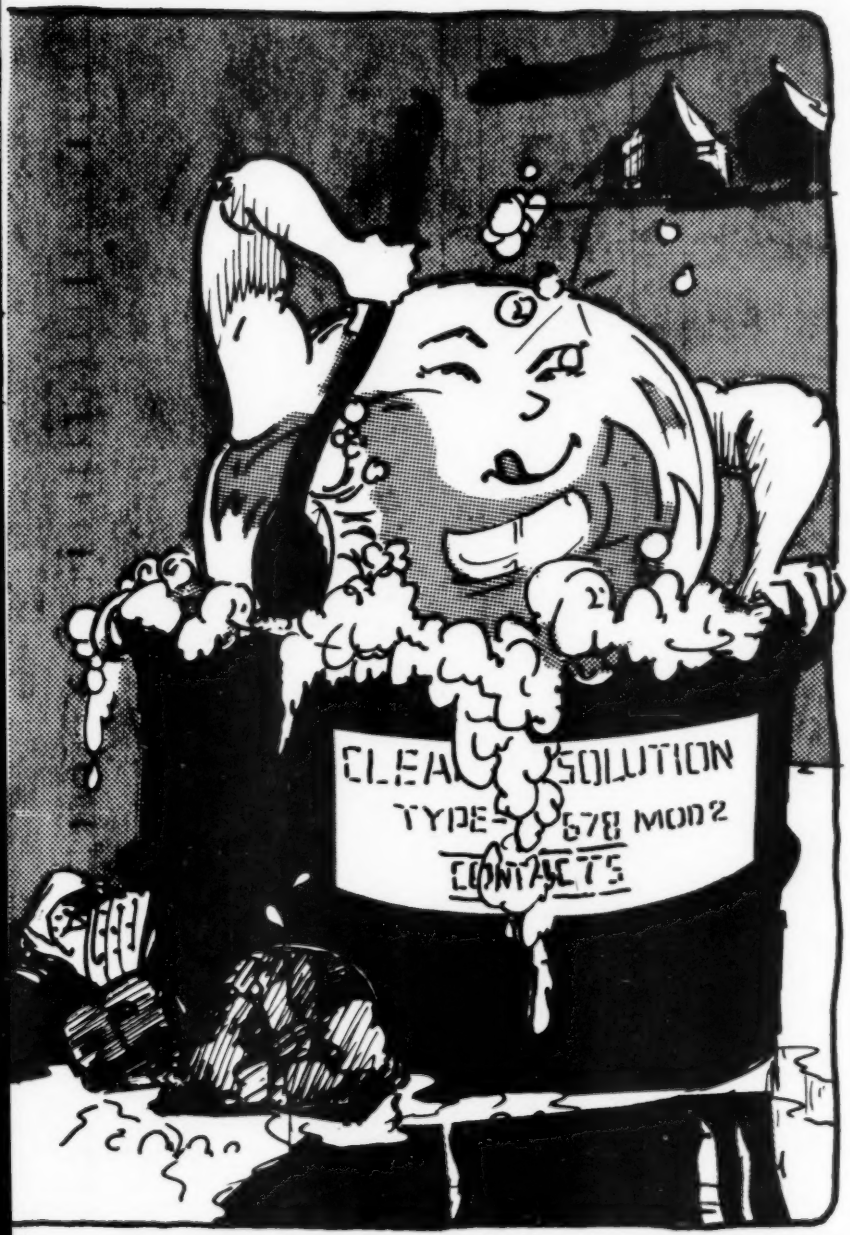
Due to their physical characteristics, these "soft" lenses have a unique problem—they absorb aerosols, noxious fumes, chemicals in solution, etc. The obvious question is: Will the lens release the absorbed impurity slowly into the eye over a period of time if the lens is not removed? If it will, it may be impossible even to enter a battery charging room—to say nothing of a chemical environment.

NEW "PERMANENT" LENSES

Recently, a new type of soft lens was developed which, being ultra-thin with good oxygen transfer properties, can be worn "permanently"—that is, for periods of up to about three months without removal, asleep or awake.

These new lenses are hard, gas permeable lenses which hold considerable promise. Although many of the problems with soft lenses will remain, these new lenses may well solve some visual difficulties of aircrews needing vision correction, particularly those in the high-speed, low-level environment and helicopter roles, without the severe drawbacks currently suspected. But as much promise as they hold, they are for the most part an unknown quantity.

In this respect, we find the medical research community actively pursuing answers to the aggravating questions about their suitability for flight. In this regard, doctors at the Opthalmic Branch of the School of Aerospace Medicine at Brooks Medical Center, are studying contact lenses carefully. Their research is fundamental in dispelling some popular rumors, and confirming others. For example, the myth that contact lenses might fall out during high speed maneuvers or violent changes in direction was clearly dispelled in an experiment in which subjects were accelerated to 9Gs without losing a lens. As for the worry over gas bubbles appearing, in tests of both hard and soft lenses, bubble formation was demonstrated under various atmospheric conditions from 6,000 ft to 25,000 ft. While initial results appear to indicate no degradation of vision or physical harm to the eye, not all environmental scenarios aviators experience have been tested. As for the concept of soft lenses absorbing chemicals and compounding problems related to chemical exposure, their research shows if the individual gets to a decontamination facility within an hour of exposure and removes the lenses, they will have actually served to protect the eyes.



During two tests on long flights in C-5 aircraft, the contact lenses performed well, but not flawlessly—researchers discovered a problem with drying. The circulation of typically dry air in the environmental control of aircraft cabins dries out the eyes considerably—this is a fatigue problem even without contact lenses, contacts compound the problem. Likewise, continued exposure to a flow of compressed oxygen dries eyes rapidly. Further, as we frail humans suffer through effects of circadian desynchronization, the eyes become fatigued, which also exacerbates the dryness problem.

To be fair, these tests aren't conclusive either way, since not all lenses have been tested for all potential problem areas (a formidable task). The information we should draw from them is indirect: There are real, rational reasons contact lenses aren't being welcomed with open arms in the aviation environment. We are testing various lenses for compatibility.

Perhaps all we need to do is wait for technology to arrive at a type lens which eliminates the problems and the issue will be solved. Until then, we already have the answer.

With difficulties like those we've highlighted here, it ought to be an easy, logical step to wait until the medical community determines what type (if any) contact lens is suitable for aviation use. You may rest assured research will progress. The idea of not having to provide as many pairs of "extra" spectacles, special lens inserts for smoke masks and other personal protective equipment speaks with quite a bark. The future looks promising for finding a lens that's suitable.

But even after it's found, tested, and determined adequate, don't expect a blanket authorization to change over. There's a big difference between the statistically relevant tests performed in the lab under controlled conditions, and the range of circumstances actually experienced in the Air Force. When the time comes, which may be quite awhile, expect to see implementation done gradually.

If you're going to perform aircrew duties for the Air Force, don't wear contact lenses. If you decide to push the point, when you're discovered (let's be realistic) you can expect to be grounded for a series of evaluations on which your continuation as a rated crewmember may rest. ✈

Thanks to Lt. Col. Robert E. Miller, II.

QUICKSTOPPERS

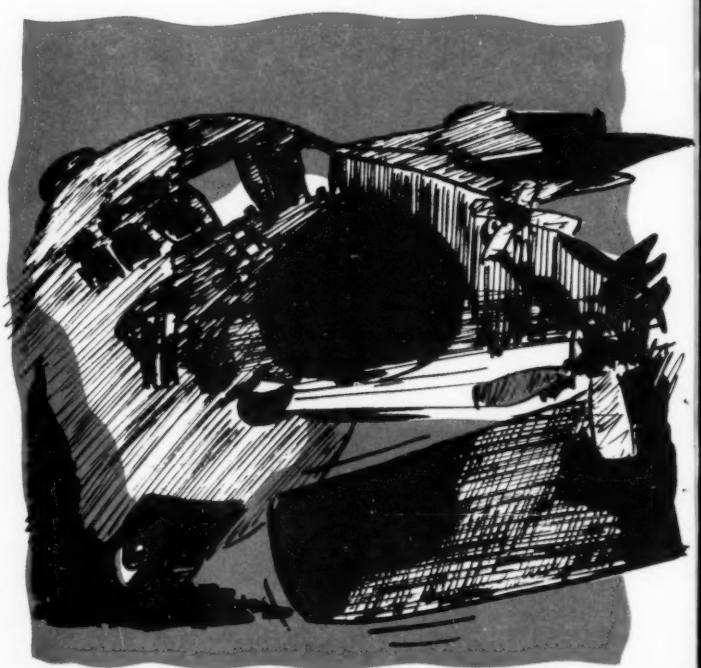
DEHYDRATION

This crewmember had only three missions under his belt when he learned (the hard way) about the hazards of poor nutrition and dehydration. The individual involved did not drink any significant amount of fluids in the 20 hours preceding his flight and also elected to skip breakfast the morning of the mission. Prior to flight, the crewmember downed two carbonated soft drinks.

One hour after takeoff, the crewmember suddenly felt exhausted. Knowing he had an hour before he would be required to perform his specialized flight duties, he pulled his coat over his head to block out the light and get some rest. This was the last thing the crewmember could clearly remember about the flight. The mission supervisor suddenly noticed the crewmember having spasms and sweating profusely. The afflicted person was experiencing heavy breathing, rapid pulse, and a minor nosebleed (probably caused by hitting his head on the equipment keyboard). Due to the apparent critical nature of the crewmember's symptoms, the AC decided to divert to the nearest base and declared an inflight medical emergency. During descent, the crewmember experienced pain in his forehead—probably a sinus block caused by the nosebleed. After landing, hospital personnel met the aircraft. The attending physician's diagnosis included dehydration with loss of consciousness.

TWO-ENGINE FLAMEOUT

The C-130 crew was scheduled to complete mission qualification training on two unit pilots. The mission was specifically designed to concentrate on assault landings and low level flight. After initial takeoff, the student pilot requested and received vectors for an ASR approach. On final, the IP took control of the aircraft in order to demonstrate normal assault landing procedures. The aircraft touched down at about 105 KIAS and the pilot retarded throttles into the ground range at approximately 100 KIAS with full reverse attained at 90 KIAS. As the aircraft decelerated to about 80 KIAS, the flight engineer called out a flame-out on number 3 engine followed shortly by a flame-out of number 1. The crew shut down both engines during landing roll out and experienced no significant directional control problems as a result of the flameouts. After an extensive investigation, the investigating officer couldn't conclusively discover why the engines flamed out, but the maintainers R&Rd those parts of the engines normally responsible for air leaks. The aircraft has experienced no subsequent engine flameouts.



SINUS BLOCK

A crewmember on one MAC aircraft learned of the uncomfortable effects caused by a sinus block during unpressurized flight at 9,000 ft. Shortly after takeoff, the soon-to-be-affected crewmember complained of a headache. The pain continued and ten minutes later was so intense the AC determined the now-affected crewmember could no longer properly perform his crew duties. The AC initiated an immediate return to home drome and flew three gradual descents. The afflicted crewmember reported no significant change in the pain level. A valsalva didn't produce the desired effects. Even application of 100% oxygen failed to relieve the painful symptoms. After an otherwise uneventful landing, the ailing crewmember was transported to the nearest medical facility and the ear block cleared in the flight surgeon's office. The flight surgeon diagnosed the problem to be a left spontaneous sinus block and concluded the crewmember had flown with an unsuspected left sinus infection.

SLUGGISH CONTROL

Flying in the local traffic pattern can be very dull and boring— that is until the unusual occurs. Witness the experience of this C-130 crew. With flaps at 50 percent and 150 KIAS, the rudder went full right without inducement from either pilot. The aircraft nose swung right. The aircraft instruments scanned "clean" and the copilot attempted to correct the problem by applying left rudder. However, the rudder wouldn't budge. After the copilot relinquished controls to the AC, the rudder went full left. The AC directed the flight engineer to turn the rudder control boost switch off. The pilot used electric right rudder trim and turned base to final. During final approach, the ailerons reacted sluggishly but pressure gauges indicated normal. The combination of turning off the rudder control boost switch and using right trim aided the AC in maintaining aircraft control. The aircraft landed a little fast—but safely. The cause of these uncommanded flight control inputs was an internal failure of the rudder and aileron boost packs.

QUICKSTOPPERS

COLDS AFFECT PASSENGERS TOO!

This C-130 was preparing to return to its Middle-Eastern bed-down when the flight deck air conditioning system temperature control valve failed. The malfunction sent smoke and intense heat into the cabin; however, no overheat lights illuminated. Both air conditioning systems were turned off. The crew believed they'd isolated the problem to the flight deck air conditioning system, but suspected the cargo compartment air conditioner may have contributed to the problem. With this in mind, and after coordinating with appropriate command and control agencies, the AC decided to fly the mission unpressurized. Although passengers were briefed the flight would be unpressurized, two of them, suffering mild upper respiratory congestion, remained on board. Neither passenger informed the crew of their condition.

The flight departed and climbed to FL 130. ATC then issued a subsequent clearance to climb to FL 160. The AC directed aircraft pressurization using cargo compartment air conditioning and under-floor heat. During cabin pressurization, (cabin altitude descent from 13,000 ft to 2,500 ft), the two passengers with colds experienced difficulty clearing their ears. The loadmaster assisted using nasal spray and various other techniques for "clearing the ears." The AC radioed ahead to alert arrival station medical authorities who, in turn, met the aircraft after it landed. The two afflicted pax were treated for hemotympanum (blood in the middle ear), and released. The mishap investigator recommended passenger briefing guides be amended to include a warning regarding the potential ill effects on the body which may be induced as a result of unpressurized flight with a cold.

AFTER DEADLINES

DID YOU SURVIVE?—Do you have a survival story you would like to share? If so, the folks at the Air Force Survival School want to hear from people like you who have experienced a survival episode. They will use your valuable experience, whether civilian or military, to let others know what to expect in a survival situation and how they might feel. Contact them at 3636 CCTW/DOV, Fairchild AFB, WA 99011-6024, Autovon 353-2371 or commercial extension (509) 247-2371/2171.

WHAT DO YOU DO WITH A USED NOSE?—Members of the 2954th Combat Logistics Support Squadron figured that out recently when they adapted obsolete C-5A radomes as shelters at their combat battle damage repair exercise facility at Brooks AFB. Squadron members moved 12 of the rounded fiberglass nose cones from Kelly AFB storage areas and set up a miniature domed city on an inactive taxiway at Brooks. "We were extemely fortunate to get them. We've been billeting troops in everything from tents to the old Brooks base exchange building," said Lt. Col. Wright Nodine, 2954 CLSS commander.

FIGHTING FOR YOUR SURVIVAL—Four MAC firefighters displayed their willingness to risk their own well-being in their dedication to save lives recently and were awarded the Air Force Commendation Medal for their performance. The four—TSgt. Robert J. Stanley, SSgt. Hector Poventud, A1C Matthew A. Flood, and A1C Frank A. Hamernik—are members of the 60th Civil Engineering Squadron at Travis AFB, California. They were among firefighters responding to a C-141 fire at Travis in October 1986. As assistant fire chief, Sergeant Stanley took charge of fire fighting operations during the blaze. Under his supervision, the fire was kept from spreading beyond the airplane's left wing. Assigned to the rescue team, Sergeant Poventud and Airmen Flood and Hamernik were responsible for entering the aircraft for initial search and rescue while the aircraft was still on fire. After making a complete check of the aircraft, the rescue team assisted other firefighters. The rescue team reentered the smoke-filled airplane several times to assess damage and check the interior for possible spread of fire. It's nice to know there's help like that available when needed.

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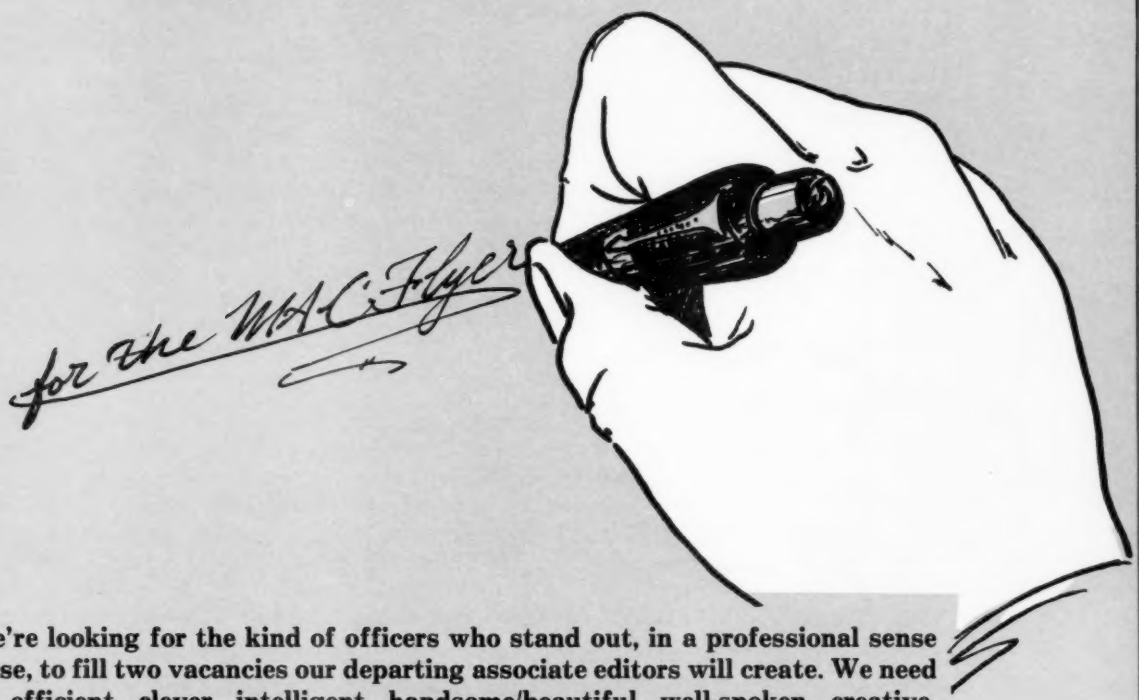
We're looking for a few good pens.



We're looking for the kind of officers who stand out, in a professional sense of course, to fill two vacancies our departing associate editors will create. We need proud, efficient, clever, intelligent, handsome/beautiful, well-spoken, creative, thorough, informed, and enthusiastic individuals who possess superb writing skills. That's right, we're lowering our standards. We know we can't *really* replace the editors we now have. Sometimes though, you just have to move on, and so it is with our current modest authors (who'd undoubtedly be Pulitzer winners except for GPO restrictions), both of whom edited this ad. We'll have positions available in May and July of 1987 for two rated captains and/or junior majors. Flight safety experience is a plus; a sense of humor is required; modesty is optional. Before concluding you haven't a chance of qualifying, remember: a journalism or public affairs background *isn't* a requirement (though it certainly won't disqualify you). Check through a few issues of *TMF* and you'll see we write just the way we talk (and we're working on improving the way we talk). This could be your big break! If your're even remotely interested (not to imply the kind of tour this is), give Major Weinzierl, Supervising Editor, a call at AV 576-3534/5542.